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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/726,533	12/01/2000	Mari Matsunaga	200309US2	1126

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EXAMINER

DEPPE, BETSY LEE

ART UNIT PAPER NUMBER

2637

DATE MAILED: 01/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	09/726,533	MATSUNAGA ET AL.	
	Examiner	Art Unit	
	Betsy L. Deppe	2637	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 17 November 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,5 and 7-18 is/are rejected.
- 7) ☒ Claim(s) 2,4 and 6 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. Claims 1 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art in Figure 10 of the present application in view of Blasiak et al. (US Patent No. 5,706,313 cited in the Office Action mailed March 3, 2004, Paper No. 3), Herzberg (US Patent No. 5,996,104 cited in the Office Action mailed February 14, 2005) and Koizumi (US Patent No. 5,995,562).

Figure 10 in the present application discloses the claimed invention of claims 1 and 7 except for decoding based on the soft decision demodulated data wherein the soft decision demodulated data is estimated as a product of hard decision data and reliability information that is calculated as recited. (See page 3, line 11 – page 7, line 22)

Figure 2 of Blasiak et al. discloses using a soft decision demodulated data estimating unit (201) and a decoding unit for decoding based on the soft decision demodulated data in a differential phase shift keying demodulator. (See column 3, line 18 - column 5, line 55) It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a soft decision demodulated data estimating unit (as disclosed by Blasiak et al.) instead of the hard decision estimating unit in the

admitted prior art of Figure 10 in order to improve the bit error rate performance of the demodulator. (See Blasiak et al. column 2, lines 52-58)

Herzberg discloses generating a soft decision equal to the product of a reliability data and hard decision data. (See column 7, lines 22-26) It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the soft decision demodulated data estimating unit by multiplying the hard decision provided by the Viterbi Sequence Estimation Unit (530) in Figure 10 with reliability information in order to have a simple soft decision demodulated data estimating unit that requires minimal calculations. Using minimal calculations for generating soft decision data minimizes the overall circuit size and power requirements.

Koizumi teaches calculating reliability information by subtracting the path metrics (which implicitly reflect the likelihood of the next state) for the survival paths to two different code states. (See Figures 3 and 4; column 5, lines 3-20) It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the reliability information calculation as disclosed by Koizumi in the circuit disclosed by the admitted prior art in view of Blasiak et al. and Herzberg in order to improve the reliability of the decoded data.

3. Claims 3, 5, 9, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art in Figure 10 of the present application in view of Blasiak et al., Herzberg, Watanabe and Nagayasu et al. (US Patent No. 6,269,124 B1 cited in the Office Action mailed March 3, 2004, Paper No. 3).

Figure 10 in the present application discloses the claimed invention of claims 3, 5, 9, and 11 except for a soft decision demodulated data estimating unit that estimates soft decision demodulated data based on a survival path metric, a power detection unit, a p-multiplying unit, and a decoding unit for decoding based on the soft decision demodulated data. (See page 3, line 11 – page 7, line 22)

Figure 2 of Blasiak et al. discloses using a soft decision demodulated data estimating unit (201) and a decoding unit for decoding based on the soft decision demodulated data in a differential phase shift keying demodulator. (See column 3, line 18 - column 5, line 55) It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a soft decision demodulated data estimating unit (as disclosed by Blasiak et al.) instead of the hard decision estimating unit in the admitted prior art of Figure 10 in order to improve the bit error rate performance of the demodulator. (See Blasiak et al. column 2, lines 52-58)

Herzberg discloses generating a soft decision equal to the product of a reliability data and hard decision data. (See column 7, lines 22-26) It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the soft decision demodulated data estimating unit by multiplying the hard decision provided by the Viterbi Sequence Estimation Unit (530) in Figure 10 with reliability information in order to have a simple soft decision demodulated data estimating unit that requires minimal calculations. Using minimal calculations for generating soft decision data minimizes the overall circuit size and power requirements.

Koizumi teaches calculating reliability information by subtracting the path metrics (which implicitly reflect the likelihood of the next state) for the survival paths to two different code states. (See Figures 3 and 4; column 5, lines 3-20) It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the reliability information calculation as disclosed by Koizumi in the circuit disclosed by the admitted prior art in view of Blasiak et al. and Herzberg in order to improve the reliability of the decoded data.

However, the admitted prior art in Figure 10 of the present invention in view of Blasiak et al., Herzberg and Koizumi does not disclose a power detection unit and a p-multiplying unit wherein the results of these units are used by the soft decision demodulated data estimating unit. Figures 4 and 7 of Nagayasu et al. teaches using a power detection unit and a p-multiplying unit wherein the results of these units are used by the soft decision demodulated data estimating unit. (See column 7, lines 10-24 and column 7, line 66 – column 8, line 4) It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the teaching of Nagayasu et al. into the circuit disclosed by the admitted prior art in Figure 10 of the present invention in view of Blasiak et al. and Nagayasu in order to further improve the bit error performance of the receiver.

4. Claims 8, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakoda et al. (US Patent No. 6,574,283 B1 cited in the Office Action mailed March 3, 2004, Paper No. 3) in view of the admitted prior art in Figure 10 in the present

application, Blasiak et al., Herzberg and Koizumi. Figures 2a and 3a of Sakoda et al. disclose the claimed invention except for a receiver having a multiple differential phase detected signal output unit and a soft decision demodulated data estimating unit. (See column 1, line 48 – column 3, line 30)

As explained in the rejection of claims 1 and 7 above, the combination of the admitted prior art in Figure 10 in the present application, Blasiak et al., Herzberg and Koizumi discloses the recited multiple differential phase detected signal output unit and the soft decision demodulated data estimating unit. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the circuit disclosed by the combination of the admitted art in Figure 10 in the present application, Blasiak et al., Herzberg and Koizumi in the DQPSK demodulation circuit (13) of Sakoda et al. in order to improve the bit error rate performance of the DQPSK system by using soft decision demodulation.

5. Claims 10, 12 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakoda et al. in view of the admitted prior art in Figure 10 in the present application, Blasiak et al., Herzberg, Koizumi and Nagayasu et al. Figures 2a and 3a of Sakoda et al. disclose the claimed invention except for a receiver having a multiple differential phase detected signal output unit and the soft decision demodulated data estimating unit wherein the soft decision demodulated data estimating unit that estimates soft decision demodulated data based on a survival path metric, a power

detection unit, a p-multiplying unit, and a decoding unit for decoding based on the soft decision demodulated data. (See column 1, line 48 – column 3, line 30)

As explained in the rejection of claims 3 and 5 above, the combination of the admitted prior art in Figure 10 in the present application, Blasiak et al., Herzberg, Koizumi and Nagayasu et al. discloses the recited multiple differential phase detected signal output unit and the soft decision demodulated data estimating unit wherein the soft decision demodulated data estimating unit that estimates soft decision demodulated data based on a survival path metric, a power detection unit, a p-multiplying unit, and a decoding unit for decoding based on the soft decision demodulated data. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the circuit disclosed by the combination of the admitted art in Figure 10 in the present application, Blasiak et al., Herzberg, Koizumi and Nagayasu et al. in the DQPSK demodulation circuit (13) of Sakoda et al. in order to improve the bit error rate performance of the DQPSK system by using soft decision demodulation.

#### ***Allowable Subject Matter***

6. Claims 2, 4 and 6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
7. The following is a statement of reasons for the indication of allowable subject matter: prior art of record does not teach or suggests in combination a demodulator.



with a soft decision demodulated data estimating unit that calculates reliability information by subtracting a likelihood for a first survival path metric from a likelihood for a second survival path metric wherein the first and second survival path metrics correspond to different states and the first survival path metric corresponds to the first survival path that transits into the first state having a minimum survival path metric and the second survival path metric corresponds to the second survival path that transits into the second state having a minimum survival path metric. The embodiment in Koizumi discloses using the larger path metric as a survivor path (see column 4, lines 14-16), not the minimum survival path metric as recited in the respective claims.

### ***Conclusion***

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Betsy L. Deppe whose telephone number is (571) 272-3054. The examiner can normally be reached on Monday, Tuesday and Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jay Patel can be reached on (571) 272 - 2988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'B. Deppe', with a stylized, flowing script.

Betsy L. Deppe  
Primary Examiner  
Art Unit 2637